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LOCKHEED MARTIN

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# Technical Safety Requirements

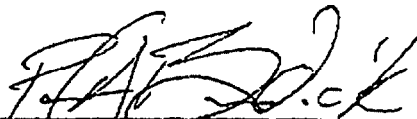
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Paducah Gaseous Diffusion Plant  
Department of Energy Nonleased Facilities  
Paducah, Kentucky

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**Technical Safety Requirements**  
**Paducah Gaseous Diffusion Plant**  
**Department of Energy Nonleased Facilities**  
**Paducah, Kentucky**

**Approvals**



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Bechtel Jacobs Company LLC

1-17-03

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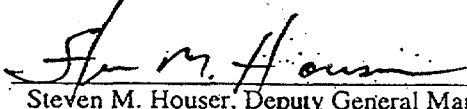
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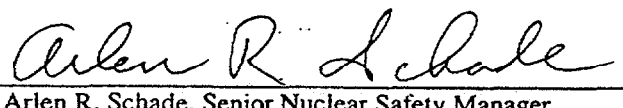
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**TECHNICAL SAFETY REQUIREMENTS**

**PADUCAH GASEOUS DIFFUSION PLANT,  
DEPARTMENT OF ENERGY NONLEASED FACILITIES**

Date Approved: \_\_\_\_\_

Prepared by  
**LOCKHEED MARTIN ENERGY SYSTEMS, INC.**  
managing the  
Environmental Management Activities  
at Paducah Gaseous Diffusion Plant  
and  
Portsmouth Gaseous Diffusion Plant  
under contract DE-AC05-84OR21400  
and managing  
Oak Ridge K-25 Site  
and  
Oak Ridge Y-12 Plant  
for the  
**U.S. DEPARTMENT OF ENERGY**

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**REVISION LOG****REVISION NUMBER****DESCRIPTION****0****Initial Issue (9/30/96)****1****Addition of TSR 3/4.2 and associated bases****2****Addition of "treatment" to the MODE definition  
for Waste handling/storage****3****Addition of LCO 3.1.2 to TSR 3/4.1 including  
associated bases and collateral page changes**

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# LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS

ALARA	as low as reasonably achievable
ANS	American Nuclear Society
ANSI	American National Standards Institute
CAAS	criticality accident alarm system
CCF	central control facility
DMSA	U.S. Department of Energy Material Storage Area
DOE	U.S. Department of Energy
DOE-ORO	U.S. Department of Energy Oak Ridge Operations
EM&EF	Environmental Management and Enrichment Facilities
ETTP	East Tennessee Technology Park
IEZ	immediate evacuation zone
IFSM	Installation Facility Safety Manager
LCO	limiting condition for operation
LCS	limiting control setting
LMES	Lockheed Martin Energy Systems, Inc.
NCS	nuclear criticality safety
NCSE	nuclear criticality safety evaluation
PCAAS	portable criticality accident alarm system
PGDP	Paducah Gaseous Diffusion Plant
PSS	Plant Shift Superintendent
SAR	safety analysis report
SL	safety limit
SR	surveillance requirement
TSR	technical safety requirement
UPS	uninterruptible power supply
USEC	United States Enrichment Corporation
USQ	unreviewed safety question

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## Section 1 — Use and Application

## 1.0 USE AND APPLICATION

The Paducah Gaseous Diffusion Plant (PGDP) is owned by the U.S. Department of Energy (DOE). The production-related facilities are leased to the United States Enrichment Corporation for producing enriched uranium. The remaining facilities are retained by DOE as nonleased facilities and are managed by Lockheed Martin Energy Systems, Inc. (LMES). These facilities currently house various Environmental Management and Enrichment Facilities (EM&EF) activities. The requirements covered by this technical safety requirement (TSR) document are generic in nature and are applicable to all facilities that exceed the Category 3 threshold values identified in DOE-STD-1027-92.<sup>1</sup> Any deviations from the generic requirements will be described in specific limiting conditions for operations (LCOs) as applicable.

## 1.1 DEFINITIONS

### 1.1 DEFINITIONS

Note: Defined terms in this list appear in uppercase throughout these TSRs.

<u>Term</u>	<u>Definition</u>
<b>ACTIONS</b>	The steps listed in each requirement that are required to be performed when the specified SAFETY LIMIT (SL), LIMITING CONTROL SETTING (LCS), or LIMITING CONDITION FOR OPERATION (LCO) is not met
<b>ADMINISTRATIVE CONTROLS</b>	The provisions relating to organization and management, procedures, record keeping, assessment and reporting necessary to ensure safe operation of the facility (see Sect. 5)
<b>CALIBRATE</b>	The adjustment (as necessary) of component output such that the component responds within the necessary range and accuracy to known values of parameters that the component monitors to ensure minimum and maximum set points are not exceeded.
<b>CRITICALITY ACCIDENT ALARM SYSTEM</b>	A fixed detection system capable of detecting a criticality event originating in the work area and providing annunciation within occupied areas wherein doses of 12 RAD in free air are expected. The CAAS meets the applicable requirements from American National Standards Institute/American Nuclear Society (ANSI/ANS)-8.3.
<b>DESIGN FEATURE FOR SAFETY (DFS)</b>	System, structure, or component that performs a passive safety function and is required for prevention/mitigation of evaluation basis events that could exceed the evaluation basis events off-site evaluation guidelines
<b>FISSIONABLE MATERIAL</b>	Any material in which a self-sustaining, neutron-induced fission chain reaction can occur. Nearly all the fissions in such a chain reaction are of the fissionable nuclides (e.g., $^{233}\text{U}$ , $^{235}\text{U}$ , or $^{239}\text{Pu}$ ) contained in the fissionable material.

## 1.1 DEFINITIONS

<u>Term</u>	<u>Definition</u>
<b>FUNCTIONAL TEST</b>	The input of a simulated or actual signal into a component to confirm OPERABILITY including required alarms and trip functions as applicable.
<b>IMMEDIATE EVACUATION ZONE (IEZ)</b>	The area where exposure to 12 RAD in free air could be expected from potential points of criticality.
<b>IMMEDIATELY</b>	Required ACTION shall be pursued without delay and in a controlled manner and be completed within 1 hour.
<b>LIMITING CONDITION FOR OPERATION (LCO)</b>	The lowest functional capability or performance level of safety-related structures, systems, components and their support systems required for normal safe operation of the facility.
<b>LIMITING CONTROL SETTING (LCS)</b>	A setting on safety-related structures, systems, and components that controls process variables to prevent exceeding SLs
<b>MODE</b>	Any one facility condition specified in Sect. 1.2
<b>OPERABLE/OPERABILITY</b>	A system or component is OPERABLE when it and its support systems and components are capable of performing their intended safety function(s) or intended support function, respectively. A system or component is considered OPERABLE when the required SURVEILLANCE has been accomplished in accordance with the required frequency and there is no indication of inoperability. When a system or component is determined to be incapable of performing its intended safety function(s), the declaration of inoperability shall be immediate.
<b>PORTABLE CRITICALITY ACCIDENT ALARM SYSTEM (PCAAS)</b>	A mobile criticality monitoring system that includes a cluster, horns, and/or visual signals (if provided) and an Uninterruptible Power Supply (UPS). The PCAAS meets the applicable requirements from ANSI/ANS-8.3.

## 1.1 DEFINITIONS

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<u>Term</u>	<u>Definition</u>
<b>SAFETY LIMIT (SL)</b>	A limit on process variables associated with those physical barriers, generally passive, that are necessary for the intended facility function and that are required to guard against the uncontrolled release of radioactivity and other hazardous materials. Process variables subject to SLs are measurable parameters that, individually or in combination, reflect the basic hazard for which controls or limits are specified.
<b>SURVEILLANCE REQUIREMENT (SR)</b>	A requirement relating to testing, calibration, or INSPECTION to ensure that the necessary OPERABILITY of systems and components is maintained or that operations are within the specified SLs, LCSs, and LCOs.
<b>VERIFY</b>	To confirm and substantiate that an activity or Condition has been implemented in conformance with requirements. Manipulation of equipment or instrumentation to conform with the specified requirement is not permitted. Methods other than direct observation may be used.

## 1.1 DEFINITIONS

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<u>Term</u>	<u>Definition</u>
TSR VIOLATION	<p>Reportable to DOE in accordance with DOE Order 232.1, <i>Occurrence Reporting and Processing of Operations Information</i>. A TSR VIOLATION is defined as including any one or a combination of the following:</p> <ul style="list-style-type: none"><li>a. exceeding an SL</li><li>b. failure to take the required ACTIONS within the specified time limits for the following:<ul style="list-style-type: none"><li>• exceeding an LCS and</li><li>• failure to meet an LCO</li></ul></li><li>c. failure to perform a SURVEILLANCE within the required time interval</li></ul> <p>NOTE: Failure to meet the acceptance criteria associated with an SR will not be considered a TSR VIOLATION but will result in the subject control/equipment being declared inoperable. Once the control/equipment is declared inoperable, the associated LCO and its action statement must be invoked</p> <ul style="list-style-type: none"><li>d. failure to comply with an ADMINISTRATIVE CONTROL (see Sect. 5)</li></ul>

## 1.2 OPERATIONAL MODES

The MODES for the DOE nonleased cylinder handling/storage and waste handling/storage facilities are as follows (These MODES do not apply to DOE Material Storage Areas (DMSAs):

Cylinder handling/storage	This MODE of operation includes receipt/shipping/storage, handling, and on-site transport of all UF <sub>6</sub> cylinders. This MODE will address all aspects of cylinder movement, including storage, shipping, overpacking, and cylinder handling. Also included in this MODE are any operations associated with the cylinders (e.g., valve changeouts, gas-over solid sampling, patching, stacking, cleaning, painting, and testing). In addition, this MODE of operation also includes any pigtail connections/disconnections.
Waste handling/storage	This MODE of operation addresses the handling of radioactive and hazardous wastes that exceed Category 3 threshold values, identified in DOE-STD-1027-92, and it includes activities supporting the characterization, certification, packaging, on-site transport, treatment, and storage of these wastes. This MODE does not include material in UF <sub>6</sub> cylinders.
Out of operation	The facility is not performing any normal operation in this MODE, and the hazardous materials that exceed the Category 3 threshold values, identified in DOE-STD-1027-92, have been removed from the facility.

The MODES for the Outside Phase 2 DOE Material Storage Areas (DMSAs) are as follows:

### OPERATION

A MODE in which the following activities are permitted:

- Walkdowns, surveillances and other reviews;
- Maintenance activities (work within or above a DMSA);
- Boundary control and sign posting activities;
- DMSA characterization activities (may include physical movement and manipulation of DMSA materials, including the use of cutting tools, cutting torches, forklifts, power tools, etc.); and
- Movement of materials within/into/out of DMSA.

### STANDBY

A MODE in which the following activities are permitted:

- Walkdowns, surveillances, boundary control and sign posting activities and other non-intrusive activities that do not disturb/move DMSA materials.



### 1.3 LIMITING CONDITIONS FOR OPERATION

LCOs establish the lowest functional capability or performance level of safety-related structures, systems, or components and their support systems required for normal safe operation of the facility. Sects. 1.3.1 through 1.3.6 establish the general requirements applicable to all LCOs at all times, unless otherwise stated.

- 1.3.1 LCOs shall be met during the MODES or other specified conditions in the applicability section, except as provided in Sect. 1.3.2.
- 1.3.2 Upon discovery of a failure to meet an LCO, the associated ACTIONS shall be met. If the LCO is restored before the specified completion time(s) expires, completion of the ACTION is not required, unless otherwise stated.
- 1.3.3 When an LCO is not met and the associated ACTIONS are not met or an associated ACTION is not provided, the facility shall be placed in a MODE or other specified condition in which the LCO is not applicable. If the LCO is applicable in all MODES, the facility shall be placed in the safest MODE. For storage operations, all handling activities shall be suspended within 1 hour until OPERABILITY is reestablished.

Where corrective measures are completed that permit operation in accordance with the LCO or ACTIONS, completion of the ACTIONS required by this section is not required.

These requirements are applicable to all MODES. Exceptions to Sect. 1.3.3 may be stated in the individual LCOs.

- 1.3.4 When an LCO is not met, a MODE or other specified condition in the applicability shall not be entered, except when the associated ACTIONS to be entered permit continued operation in the MODE or other specified condition in the applicability for an unlimited period of time. This shall not prevent changes in MODES or other specified conditions in the applicability that are required to comply with ACTIONS.

Exceptions to this section are stated in the individual LCOs. When an individual LCO states that this section does not apply, it allows entry into MODES or other specified conditions in the applicability when the associated ACTIONS to be

### 1.3 LIMITING CONDITIONS FOR OPERATION

entered permit operation in the MODE or other specified condition for only a limited time.

- 1.3.5** Equipment removed from service or declared inoperable to comply with ACTIONS may be returned to service under administrative control solely to perform testing required to demonstrate its OPERABILITY or the OPERABILITY of other equipment. This is an exception to Sect. 1.3.2 for the system returned to service under administrative control to perform the testing required to demonstrate OPERABILITY.
- 1.3.6** When a support system is inoperable and an LCO for that support system is specified in the TSRs, the supported system is not required to be declared inoperable due solely to support system inoperability. Only the support system's ACTIONS are required to be entered. This is a clarification of the definition of OPERABILITY. Sect. 1.3.2 is still applicable to the supported system.

#### 1.4 TIME INTERVALS FOR SURVEILLANCE

The time intervals as used in the surveillances are defined as follows:

Interval designation	Interval between consecutive surveillances	Maximum interval between consecutive surveillances
Twice each shift	6 h	8 h
Shiftly	12 h	15 h
Daily	24 h	30 h
Monthly	31 days	39 days
Quarterly	92 days	123 days
Semiannually	184 days	245 days
Annually	365 days	456 days
Biennially	2 yr	2 yr 6 mo
Five-year	5 yr to the day	5 yr to the day (unless specifically stated otherwise)

**NOTES:** The extension between the standard and the maximum surveillance intervals is intended to be used to accommodate operational and maintenance scheduling. The time interval between surveillances on in-service equipment should not routinely extend to the maximum allowable interval.

The extension between the standard and the maximum surveillance intervals is 25% of the standard value with the exception of twice each shift, quarterly, and semiannual items. The extension on these intervals is 33% to be consistent with past plant practice, which has been in accordance with DOE 5481.1B, "Safety Analysis and Review System."

## 1.5 SURVEILLANCE REQUIREMENTS

SRs are requirements relating to test, calibration, or inspection to ensure that the necessary quality of safety-related structures, systems, and components is maintained and that the LCO will be met. Sects. 1.5.1 through 1.5.4 establish the general requirements applicable to all SRs and apply at all times, unless otherwise stated.

- 1.5.1 SRs shall be met during the MODES or other specified conditions in the applicability for individual LCOs unless otherwise stated in the SR. Failure to meet a surveillance shall constitute failure to meet the LCO (see Sect. 1.3.2). Failure to perform a surveillance within the specified frequency shall constitute failure to meet the LCO, except as provided in Sect. 1.5.3. Surveillances do not have to be performed on inoperable equipment or variables outside specified limits.
- 1.5.2 The specified frequency for each SR is met if the surveillance is performed within 1.25 times the interval specified in the frequency, as measured from the previous performance or as measured from the time a specified condition of the frequency is met.

For frequencies specified as "once," the above interval extension does not apply.

If a completion time requires periodic performance of "once every...", the above frequency extension applies to each performance after the initial performance.

Exceptions to this section are stated in the intervals described in Sect. 1.4.

- 1.5.3 If it is discovered that a surveillance was not performed within its specified frequency, compliance with the requirement to declare the LCO not met may be delayed from the time of discovery up to 24 hours or up to the limit of the specified frequency, whichever is less. This delay period is permitted to allow performance of the surveillance.

If the surveillance is not performed within the delay period, the LCO shall IMMEDIATELY be declared not met, and the applicable ACTIONS shall be entered. The completion times of the ACTIONS begin IMMEDIATELY on expiration of the delay period. When the surveillance is performed within the delay period and the surveillance is not met, the LCO shall IMMEDIATELY be declared not met, and the applicable ACTIONS shall be entered. The completion times of the ACTIONS begin IMMEDIATELY on failure to meet the surveillance.

**1.5 SURVEILLANCE REQUIREMENTS**

- 1.5.4** Entry into a MODE or other specified condition in the applicability of an LCO shall not be made unless the LCO's surveillances have been met within their specified frequency. This provision shall not prevent passage through or to MODES of other specified conditions in compliance with ACTIONS.

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## Section 2 — Safety Limits

## **2.0 SAFETY LIMITS**

There are no SLs for the PGDP DOE nonleased facilities.

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**Section 3/4 — Operational Limits and Surveillance Requirements**



**3/4.0 OPERATIONAL LIMITS AND SURVEILLANCE REQUIREMENTS****3/4.1 CRITICALITY ACCIDENT ALARM SYSTEMS**

**LCO 3.1.1:** Nonleased processes that contain greater than 700 g of FISSIONABLE MATERIAL shall have operable criticality accident detection/alarm coverage capability, except where approved exemptions have been identified.

**APPLICABILITY:** MODES: Waste handling/storage

**ACTIONS**

Condition	Required action	Completion time
A. Areas, equipment, or processes not covered by criticality accident detection/alarm capability	1.a Discontinue movement of containers containing any FISSIONABLE MATERIAL. <u>AND</u> Waste containing any FISSIONABLE MATERIAL shall not be transported.	IMMEDIATELY
	<u>OR</u> 1.b Evacuate area in which a criticality accident occurring within the area not covered by detection capability could result in a maximum foreseeable dose exceeding 12 rad. <u>AND</u> Restrict access to the evacuated area.	IMMEDIATELY
	<u>OR</u> 1.c Provide personnel in the area who would be restricted under ACTION A.1.b with an alternate means of criticality alarm notification: a device that will alarm on sensing a 20-mrad/h dose rate.	IMMEDIATELY
	<u>AND</u>	
	2.a Restore at least one fixed cluster/alarm providing detection capability and alarm capability for those areas, equipment, or processes applicable to this LCO.	24 h
	<u>OR</u> 2.b Install portable criticality accident alarm system (CAAS) unit providing required detection capability and local alarm capabilities.	24 h
B. ACTION condition A not satisfactorily completed	1. Continue required ACTIONS for condition A. <u>AND</u> 2. Restore criticality accident detection and alarm capability to operable status.	IMMEDIATELY  30 days

**3/4.1 CRITICALITY ACCIDENT ALARM SYSTEMS****SURVEILLANCE REQUIREMENTS**

Surveillance		Frequency
SR 4.1.1-1	Verify operability of the detector units by using a radiation source.	Semiannually
SR 4.1.1-2	Verify local alarm operability. This test shall include actuating the alarm, verifying nitrogen pressure $\geq 1000$ psig, and applying a back pressure to the check valve at any nitrogen/plant air interface to ensure operability of the check valve (not applicable to C-746-Q, this facility is not connected to the plant air system).	Quarterly
SR 4.1.1-3	Verify operability of each air-operated building alarm in the same manner as described in SR 4.1.1-2.	Quarterly
SR 4.1.1-4	Perform an integrated test of the entire CAAS in accordance with American National Standards Institute (ANSI)/American Nuclear Society (ANS) 8.3, Sect. 6.4.	Semiannually

**3/4.1 CRITICALITY ACCIDENT ALARM SYSTEMS**

**LCO 3.1.2:** An OPERABLE PORTABLE CRITICALITY ACCIDENT ALARM SYSTEM (PCAAS) shall be capable of detecting a nuclear criticality accident and providing evacuation annunciation capability within the IMMEDIATE EVACUATION ZONE (IEZ). Portions of the IEZ where annunciation capability cannot be reasonably established with the installation of PCAAS units shall be demarcated, posted, and personnel prohibited from accessing the affected area.

**MODE**

**APPLICABILITY:** OPERATION

**PROCESS AREA**

**APPLICABILITY:** Outside Phase 2 Department of Energy (DOE) Material Storage Areas (DMSAs).

**ACTIONS****NOTE**

Separate Condition entry is allowed for each Outside Phase 2 DMSA.

Condition	Required Action	Completion Time
A. PCAAS is not OPERABLE.	A.1 Place the applicable Outside Phase 2 DMSA(s) in STANDBY.	IMMEDIATELY
B. Areas where annunciation is not provided and: are not posted; or not demarcated; or personnel are present.	B.1 Place the applicable Outside Phase 2 DMSA(s) in STANDBY.	IMMEDIATELY

**3/4.1 CRITICALITY ACCIDENT ALARM SYSTEMS****SURVEILLANCE REQUIREMENTS**

Surveillance	Frequency
SR 4.1.2-1 Perform a FUNCTIONAL TEST of the PCAAS.	DAILY
SR 4.1.2-2 VERIFY communication ability between the Outside Phase 2 DMSA(s) and the CCF.	DAILY
SR 4.1.2-3 Perform an OPERABILITY test of PCAAS detector units by using a radiation source and perform a cluster logic test. The radiation source test shall VERIFY that the PCAAS high radiation alarm is actuated at 15 mR/hr $\pm$ 1.0. The cluster logic test shall VERIFY that PCAAS coincidence logic is operating normally.	Upon initial installation for a covered operation  <u>AND</u>  MONTHLY thereafter
SR 4.1.2-4 VERIFY PCAAS annunciation in the area(s) of the IEZ not demarcated and posted are visible or audible above background noise.	Upon initial installation for a covered operation  <u>AND</u>  If noise conditions significantly increase or visibility conditions significantly decrease  <u>AND</u>  MONTHLY thereafter
SR 4.1.2-5 CALIBRATE PCAAS detector modules. The high radiation alarm shall be set for 15mR/h $\pm$ 1.0.	ANNUALLY
SR 4.1.2-6 VERIFY demarcation and postings are in place for the portions of the IEZ where annunciation cannot be reasonably established. VERIFY that personnel are not present in the portions of the IEZ where annunciation cannot be reasonably established.	Upon initial installation for a covered operation  <u>AND</u>  MONTHLY thereafter

**3/4.2 C-745-T CYLINDER STORAGE YARD BOUNDARY**

**LCO 3.2.1** A boundary shall be established in the C-745-T Cylinder Storage Yard at a minimum distance of 900 feet from the site boundary any time CYLINDERS CONTAINING UF<sub>6</sub> are present. The boundary demarcation consists of nominal 4-foot cylinder chocks, placed approximately 4 feet apart, with an orange mesh, 48-inch high barrier fence supported approximately every 16 feet by metal stanchions. A buffer zone shall be maintained for a minimum distance of 25 feet from the boundary to cylinder storage arrays. Signs shall be posted approximately every 80 feet with the following warning in white letters on a royal blue field:

**WARNING**

Cylinders shall not be transported beyond this boundary. The storage of UF<sub>6</sub> cylinders beyond this sign is a violation of the Technical Safety Requirements for the operation of C-745-T.

**APPLICABILITY: MODES:** Cylinder handling/storage

**ACTIONS**

Condition	Required action	Completion Time
A. Boundary demarcation not present as described when CYLINDERS CONTAINING UF <sub>6</sub> are within C-745-T.	1. Discontinue movement of CYLINDERS CONTAINING UF <sub>6</sub> within C-745-T <u>AND</u> Prohibit any other CYLINDERS CONTAINING UF <sub>6</sub> from entering.	IMMEDIATELY
	<u>AND</u> 2. Restore barrier to the described condition.	4 hours
B. Restoration of barrier cannot be satisfactorily completed.	1. Continue required ACTIONS for condition A. <u>AND</u>	IMMEDIATELY
	2. Restore barrier to the described condition.	30 days
C. Buffer zone not maintained between barrier and cylinder storage array.	1. Discontinue movement of UF <sub>6</sub> cylinders to buffer zone <u>AND</u>	IMMEDIATELY
	2. Relocate cylinders to positions outside the buffer zone.	24 hours

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**3/4.2 C-745-T CYLINDER STORAGE YARD BOUNDARY**

**SURVEILLANCE REQUIREMENTS**

Surveillance	Frequency
SR 4.2.1-1 Verify the condition and position of demarcation fencing, stanchions, and postings.	Monthly
SR 4.2.1-2 Verify the legibility of postings.	Semiannually
SR 4.2.1-3 Verify the position of chocks.	Annually

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## Section 5 — Administrative Controls

## **5.0 ADMINISTRATIVE CONTROLS**

### **5.1 CONTRACTOR RESPONSIBILITY**

- 5.1.1** The EM&EF Site Manager shall have corporate responsibility for overall safety within DOE nonleased facilities and shall have authority to take any measures needed to ensure acceptable performance of the staff in operating, maintaining, and providing technical support to the plant to secure nuclear safety.
- 5.1.2** The Installation Facility Safety Manager (IFSM) serves as the site subject matter expert for the technical areas associated with facility safety and coordinates and oversees implementation of the Facility Safety Program for the site. The IFSM or his/her designee shall approve, prior to implementation, each proposed test, experiment, or modification to systems or equipment that affect nuclear safety. The IFSM shall delegate in writing the succession to this responsibility when absent from the plant site.
- 5.1.3** The Plant Shift Superintendent (PSS) shall be responsible for emergency response at the plant and for the central control room command function. This function is a shared site responsibility for leased and nonleased facilities.<sup>2</sup> During any absence of the PSS from the central control room while the plant is operational, an authorized designee shall be named and be present in the central control room. The term "designee" means a person who has been trained to execute plant emergency procedures. The designee shall have the capability to be in contact with the PSS by using the plant communication systems when the PSS is absent from the central control facility.
- 5.1.4** The Facility Manager/Owner shall be responsible for the operations conducted within the facilities affected by this TSR for which he/she is responsible.

### **5.2 ORGANIZATION**

#### **5.2.1 On-Site**

On-site organizations shall be established for facility operation. The on-site organizations shall include the positions for activities affecting the nuclear safety of the EM&EF activities and are described in Sect. 17.3 of the SAR.



## **5.2 ORGANIZATION**

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- a. Lines of authority, responsibility, and communication shall be established and defined for the highest management levels through intermediate levels to include operating organization positions. These relationships shall be documented and updated, as appropriate, in the form of organizational charts, functional descriptions of organizational responsibilities and relationships, and job descriptions for positions down to and including first-line managers.
- b. Individuals who perform training, health physics, quality assurance, nuclear criticality safety, and/or other safety and oversight functions shall have sufficient organizational freedom to ensure the essential level of operational independence.

### **5.2.2 Facility Staff**

These facilities have no minimum staffing requirements.

## **5.3 PROCEDURES**

Procedures shall be established, implemented, and maintained for normal operation, for emergency operations, and for all programs listed in Sect. 5.4. Any requirements established by the SAR shall be proceduralized.

Procedures shall be kept current by formal issuance of new procedures and revisions in accordance with approved procedures.

## **5.4 PROGRAMS**

### **5.4.1 Nuclear Criticality Safety Program**

A nuclear criticality safety program shall be established, implemented, and maintained as described in Chap. 6 of the SAR and shall address the following elements:

- adherence with ANSI/ANS standards,
- nuclear criticality safety (NCS) responsibilities,
- process evaluation and approval,
- design philosophy and review,

## 5.4 PROGRAMS

- CAAS coverage,
- procedure requirements,
- posting and labeling requirements,
- change control,
- operation surveillance and assessment,
- technical aspects,
- a qualified NCS Engineer must evaluate and approve the placement of PCAAS, and
- IEZ boundaries developed for non-leased DOE facilities shall be documented and determined by NUREG/CR-6504<sup>7</sup>, or another DOE-ORO approved methodology.

5.4.1.1 All operations involving uranium enriched to  $\geq 1.0$  wt%  $^{235}\text{U}$  and  $\geq 700$  g of  $^{235}\text{U}$  shall be based upon a documented nuclear criticality safety evaluation and shall be performed in accordance with a documented nuclear criticality safety approval.

5.4.1.2 NCS calculations shall be performed in accordance with the requirements of ANSI/ANS-8.1-1983. The system and codes used for these calculations shall be validated for the appropriate range of applicability and these validations shall be documented.

5.4.1.3 The double-contingency principle, as described in the SAR, shall be used as the basis for the design and operation of processes using fissionable materials. In each instance where-in double contingency is not met, in addition to those cases already described in Chap. 6 of the SAR, technically evaluated and documented exceptions must be provided to and approved by DOE. Existing Phase 2 DMSAs constitute a potential singularly-contingent condition which has been approved by DOE<sup>4</sup>.

5.4.1.4 The CAAS is a leased system that provides coverage for nonleased areas as well as nonleased operations within leased facilities. For nonleased operations within leased areas, the requirements for the CAAS will be in accordance with the leased facility TSRs.<sup>2</sup>

The PCAAS provides coverage for applicable work activities within (1) areas without annunciation coverage from a fixed CAAS as allowed by LCO 3.1.1, and (2) Outside Phase 2 DMSAs as allowed by LCO 3.1.2.

### 5.4.2 Radiation Protection Program

A radiation protection program shall be established, implemented, and maintained as described in the SAR Sect. 7.3 and shall address the following elements:

- health physics technician training and qualifications,
- personnel exposure control and measurement,
- contamination control,
- radioactive material control,

## **5.4 PROGRAMS**

- radiological protection instruments and equipment, and
- records and reports.

### **5.4.3 Hazardous Material Protection Program**

A hazardous material protection program shall be established, implemented, and maintained and shall ensure the following objectives are met as described in the SAR Sect. 8.3:

- hazardous material as low as reasonably achievable (ALARA) policy and program,
- hazardous material training,
- hazardous material exposure control (e.g., identification of hazardous material, administrative limits, occupational medical programs, and respiratory protection),
- hazardous material monitoring to protect workers, the public, and the environment,
- hazardous material protection instrumentation,
- hazardous material protection record keeping,
- hazard communication program, and
- occupational chemical exposures.

### **5.4.4 Radioactive Waste Management Program**

A radioactive waste management program shall be established, implemented, and maintained as described in the SAR Sect. 9.3 and shall address the following elements:

- radiological characterization,
- waste packaging and labeling,
- radioactive waste processing and storage,
- off-site waste shipments, and
- waste disposal.

### **5.4.5 Initial Testing and In-Service Surveillance Testing Program**

A testing program that includes both initial testing of new equipment and surveillance testing of equipment following installation shall be established, implemented, and maintained as described in Chap. 10 of the SAR. The testing

## **5.4 PROGRAMS**

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program shall ensure that the following objectives are met for any equipment designated as safety-class:

- vendor testing of ordered equipment meets requirements,
- proper equipment is received and installed, and
- installed equipment satisfies specifications and demonstrates satisfactory performance.

The surveillance program shall meet the following objectives for any equipment designated as safety-class or that requires an operating limit in Sects. 2, 3, and 4:

- identify the activities to be monitored,
- identify the frequency of the surveillance,
- identify the individual or organization responsible for conducting the surveillance,
- generate and update surveillance schedules and plans,
- assess compliance,
- document surveillances, and
- document nonconformances and initiate corrective actions.

### **5.4.6 Maintenance Program**

A maintenance program shall be established, implemented, and maintained as described in the SAR Sect. 10.5 and shall address the following program elements for any equipment designated as safety-class or safety-significant:

- training,
- maintenance procedures,
- maintenance programs,
- work control,
- postmaintenance testing,
- procurement, receipt inspection, control, and issuance of safety-class and safety-significant items, repair parts, materials and services,
- control of measuring and test equipment, and
- maintenance history.

## **5.4 PROGRAMS**

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### **5.4.7 Conduct of Operations**

A conduct of operations program shall be established, implemented, and maintained as described in the SAR Sect. 11.3. The conduct of operations program shall address the following elements:

- operator responsibilities,
- shift routine,
- control area activities,
- communications,
- control of equipment,
- log keeping,
- permits and tagging, and
- procedures, operator aids, and system labeling.

### **5.4.8 Fire Protection Program**

A fire protection program shall be established, implemented, and maintained as described in SAR Sect. 11.4 and shall address the following elements:

- fire hazard description and evaluation,
- fixed fire suppression and fire detection systems,
- mobile and portable equipment,
- testing and inspection,
- staffing, and
- fire investigation, permits, and procedures.

### **5.4.9 Training Program**

The training program shall ensure that individuals relied upon to operate, maintain, or modify the plant in a safe manner are properly trained to do so. It shall be based on a systems approach to training. The training program shall be established, implemented, and maintained as described in the SAR Sect. 12.4. The training program is applicable to all facilities that exceed the Category 3 threshold values identified in DOE-STD-1027-92 and shall consist of the following basic components:

## **5.4 PROGRAMS**

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- systematic analysis of jobs to be performed,
- learning objectives derived from the analysis that describe desired performance after training,
- training design and implementation based on the learning objectives,
- evaluation of trainee mastery of the objectives during training, and
- evaluation and revision of the training based on the performance of trained personnel in the job setting.

### **5.4.10 Quality Assurance Program**

A quality assurance program shall be established, implemented, and maintained as described in the SAR Sect. 14.2. The quality assurance program is applicable to all facilities that exceed the Category 3 threshold values identified in DOE-STD-1027-92 and shall ensure that the following objectives are met:

- ensure that personnel are trained and qualified to perform their assigned work and are provided continuing training to ensure that job proficiency is maintained,
- establish and implement processes to detect and prevent quality problems and to ensure quality improvement,
- prepare, review, approve, issue, use, and revise documents to prescribe processes, specify requirements, or establish design,
- perform work to established technical standards and ADMINISTRATIVE CONTROLS,
- design items and processes using sound engineering/scientific principles and appropriate standards,
- ensure that procured items and services meet established requirements and perform as specified,
- inspect and acceptance-test specified items and processes using established acceptance and performance criteria,
- assess, at all levels, the integrated quality assurance program and its performance, and
- perform planned and periodic independent assessments to measure item quality and process effectiveness and to promote improvement.

## **5.4 PROGRAMS**

### **5.4.11 Emergency Preparedness Program**

An emergency preparedness program shall be established, implemented, and maintained as described in the SAR Sect. 15.3. The emergency preparedness program shall ensure that the following objectives are met:

- develop and maintain emergency planning, preparedness, and response capabilities, as well as effective public and interagency communications, in order to minimize the consequence to workers, the public, and the environment from incidents involving DOE operations, and
- respond to emergencies in an effective and timely manner to mitigate the consequences and bring the emergency situation under control.

## **5.5 OPERATING SUPPORT**

The Facility Manager shall maintain the ability to contact additional support, as needed during operations, that includes personnel such as the PSS and the Facility Safety Organization.

Support personnel from other organizations shall be trained as applicable to perform their duties in a safe, efficient, and correct manner to meet state and federal requirements.

All personnel assigned to the facility shall be included in the qualification and training program as described in Chap. 12 of the SAR.

## **5.6 TECHNICAL SAFETY REQUIREMENTS BASIS CONTROL**

Changes may be made to the TSR bases without prior DOE approval provided the changes do not involve any of the following:

- a change in the TSR,
- a change to the System SAR that involves an Unreviewed Safety Question as defined in DOE Order 5480.21, or

## **5.6 TECHNICAL SAFETY REQUIREMENTS BASIS CONTROL**

- a change to the way that OPERABILITY or the TSR could be met, applied, or interpreted.

Proposed changes meeting any of the above criteria shall be reviewed and approved by the DOE prior to implementation. Changes to the TSR bases that may be implemented without prior DOE approval will be provided to the DOE at least ANNUALLY.

## **5.7 REVIEWS AND AUDITS**

A system of audits and assessments is implemented at PGDP to ensure that the health, safety, safeguards, security, and environmental programs, as described in the SAR and the accompanying programs, plans, and other documents, are adequate and are effectively implemented.

This TSR shall be reviewed ANNUALLY and a report of this review forwarded to the Contracting Office Representative. All changes to operating practices that require changes to this TSR shall be approved by DOE.

## **5.8 FACILITY OPERATING RECORDS**

In addition to the requirements of applicable regulation, records and logs shall be prepared for at least the following items and retained for at least the period indicated in parenthesis:

- normal and emergency conditions of facility operation (5 years),
- maintenance activities relative to safety-related equipment (5 years),
- equipment and component SURVEILLANCE activities required by the TSRs (life of facility),
- record of reviews and audits (5 years),



## **5.8 FACILITY OPERATING RECORDS**

- occurrence reports as required by DOE Order 232.1, *Occurrence Reporting and Processing of Operations Information* (5 years), and
- training records (5 years).

## **5.9 REPORTING REQUIREMENTS**

In the event of a reportable occurrence, ACTIONS shall be governed by DOE Order 232.1, *Occurrence Reporting and Processing of Operations Information*.

## **5.10 REFERENCE**

1. *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23*, DOE-STD-1027-92, U.S. Department of Energy, Washington, D.C., December 31, 1992.
2. *USEC and DOE Resolution of Shared Site Issues at the Gaseous Diffusion Plants*, U. S. Department of Energy and United States Enrichment Corporation, dated January 24, 1996.

**Appendix A —**  
**Technical Safety Requirement Bases**

**3/4.0 BASES - OPERATIONAL LIMITS AND SURVEILLANCES****3/4.1 CRITICALITY ACCIDENT ALARM SYSTEMS (CAAS)****3/4.1.1 CAAS****BASES**

<b>BACKGROUND</b>	The CAAS is used to warn plant personnel of a criticality or radiation accident. This system is designed to detect radiation and provide a distinctive, audible signal that will alert personnel to move from those work areas which are potentially affected. The design of the system, three detector modules per cluster, provides protection for criticality events even with partial losses of required equipment. The CAAS also provides detection coverage in most areas by using an overlapping pattern of individual cluster units.
<b>APPLICABLE SAFETY ANALYSIS</b>	The ability of the CAAS to provide detection/alarm coverage of areas covered by the CAAS is required to minimize the potential on-site exposure of personnel to radiation from an accidental criticality (see applicable SAR subsections 4.4). The only nonleased process presently requiring coverage is C-746-Q.
<b>LCO</b>	The alarming of a criticality accident is necessary for the prompt evacuation of personnel from the affected area to a designated assembly point a safe distance from the incident. The intent of these requirements is to ensure that adequate detection and alarm capability are provided by the CAAS to detect criticality events in any EM&EF area that could have an accidental criticality.
<b>APPLICABILITY</b>	CAAS coverage is required in areas that have more than 700 g of FISSIONABLE MATERIAL, provided no justification for excluding alarm coverage is provided.

3/4.1 CRITICALITY ACCIDENT ALARM SYSTEMS (CAAS)**BASES (cont'd)****ACTIONS**

The identified conditions and associated action items address periods of inoperability and the associated actions required to provide a similar level of protection. The primary function of the system is to evacuate personnel from the potentially affected area. The actions presented in the table accomplish this function or provide alternate means of detection and alarm in each case. When possible, the limiting of material movement minimizes the potential for an accidental criticality.

**SURVEILLANCE  
REQUIREMENTS****SR 4.1.1-1**

Sect. 6.3 of ANSI/ANS-8.3<sup>1</sup> specifies that this testing be performed at least monthly for operability verification. However, the type of detectors provided at PGDP have a self-test feature that accomplishes the same function on a continual basis. The basis for semi-annual testing is provided in a letter from D. J. Bostock to D. R. Allen, November 29, 1990.<sup>2</sup>

**SR 4.1.1-2**

Sect. 6.4 of ANSI/ANS-8.3 specifies that this testing be performed at least quarterly for OPERABILITY verification.

**SR 4.1.1-3**

Sect. 6.4 of ANSI/ANS-8.3 specifies that this testing be performed at least quarterly for OPERABILITY verification.

**SR 4.1.1-4**

See SR 4.1.1-1 above for justification of this testing interval. This test can be used as a substitute for tests described in SRs 4.1.1-1, 4.1.1-2, and 4.1.1-3 above.

3/4.1 CRITICALITY ACCIDENT ALARM SYSTEMS (CAAS)

**BASES (cont'd)**

**REFERENCES**

1. "Criticality Accident Alarm System," ANSI/ANS-8.3, 1986.
  2. "Request for Exemption to the Paducah Gaseous Diffusion Plant's Criticality Accident Alarm System," letter from D. J. Bostock to D. R. Allen, November 29, 1990.
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### 3/4.0 BASES – OPERATIONAL LIMITS AND SURVEILLANCES

#### 3/4.1 CRITICALITY ACCIDENT ALARM SYSTEMS (CAAS)

##### 3/4.1.2 PCAAS (LCO 3.1.2)

#### BASES

##### BACKGROUND SUMMARY

Phase 2 U.S. Department of Energy (DOE) Material Storage Areas (DMSAs) contain equipment, materials, and waste that were used/generated in support of uranium-enrichment operations and may contain fissile material (i.e.,  $\geq 1$  wt%  $^{235}\text{U}$ ). Some of the DMSAs contain equipment from the East Tennessee Technology Park (ETTP) (formerly K-25 Site) or Portsmouth Site. The equipment from these sites may contain uranium with a higher enrichment than that used at the Paducah Site. Phase 2 DMSAs contain materials that may or may not be fully characterized; however, they are known to contain fissile or potentially fissile material based on inspection or characterization. The gaseous diffusion plant process equipment is stored in disorganized arrays such that there is the potential for the equipment, materials, and waste to be in storage configurations that are not in compliance with Nuclear Criticality Safety (NCS) spacing and storage requirements. Although there is an absence of a complete characterization or inventory of the materials stored in the Phase 2 DMSAs, a Nuclear Criticality Safety Evaluation<sup>2</sup> (NCSE) covers the characterization, movement, storage, and disposition of fissile materials within the Phase 2 DMSAs.

American National Standards Institute/American Nuclear Society (ANSI/ANS)- 8.3<sup>1</sup> requires that the need for accidental criticality detection and alarm be evaluated for areas that can accumulate  $>700$  grams of FISSIONABLE MATERIAL and  $\geq 1$  wt%  $^{235}\text{U}$ .

Some of the Phase 2 DMSAs are outside of fixed Criticality Accident Alarm System (CAAS) coverage. These DMSAs are referred to as Outside Phase 2 DMSAs. In the Safety Evaluation Report<sup>4</sup> (SER) for the Unreviewed Safety Question (USQ)<sup>5</sup> associated with DMSAs, DOE accepted the risk of those areas being outside the demonstrated CAAS coverage area for static conditions. Therefore, in order to perform activities that involve movement or disturbance of material (i.e., that impact static conditions) for characterization and disposition in the Phase 2 DMSAs without fixed CAAS coverage, a portable CAAS (PCAAS) is needed.

**3/4.1.2 PCAAS (LCO 3.1.2)****BASES (Continued)**

The detection capability for the PCAAS units is the same as for the fixed system. The detectors are interchangeable. However, because of their annunciation limitations, a PCAAS unit may be incapable of providing annunciation throughout an IMMEDIATE EVACUATION ZONE (IEZ) as does the fixed CAAS. PCAAS units may be used to provide annunciation coverage within the capabilities of the unit. Unit placement and approval is governed by contractor procedures. Contractor procedures for PCAAS units address the following:

- A defined approval process for operating and maintaining PCAAS units.
- Training requirements for personnel relying on protection by PCAAS.
- A process for determining PCAAS location and associated detector coverage area.
- Verification that the PCAAS horns are OPERABLE and the alarm signal is audible above background noise or visible throughout the coverage area not demarcated and posted upon initial installation and MONTHLY thereafter.
- A process to preclude PCAAS power disruption and/or unit relocation.
- A process for establishing the location of the Assembly Points for Outside Phase 2 DMSAs.
- Verification that a means of communication with the Plant Shift Superintendent (PSS) is provided.\*
- Verification that the PCAAS power supply and cluster are operating properly.\*
  - Verify that the AC power is available.
  - Verify that the uninterruptible power supply (UPS) unit is not in a fault condition.
  - Verify that each Detector background reading is 5 mR/hr  $\pm$  0.5 mR/hr.
  - Verify that there are no alarms or fault indications on the detector.
- Verification that PCAAS operational test (cluster radiation response and logic tests) is completed upon initial installation for a covered operation and MONTHLY thereafter.\*

## 3/4.1.2 PCAAS (LCO 3.1.2)

## BASES (Continued)

- Verification that the PCAAS detectors have been calibrated and will remain current or be maintained current while in use.

\*These verifications are conducted and documented DAILY. This frequency is acceptable because of limited coverage area, limited access, and reliable components. Contractor procedures may provide additional SURVEILLANCE REQUIREMENTS.

\*This frequency is conservative in that the detectors are actuated with a radiation source upon initial installation and MONTHLY thereafter during the cluster radiation response test. While the units are constructed utilizing the same components as the fixed system, the "upon initial installation" testing is conducted to ensure that transportation of the PCAAS does not affect its OPERABILITY.

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APPLICABLE  
SAFETY  
ANALYSIS

The SAR<sup>3</sup> and the safety analysis portion of the submittal, dated September 11, 2002<sup>6</sup>, provide the hazard and accident analysis for the characterization and disposition activities in the Outside Phase 2 DMSAs. The hazard analysis evaluated characterization and disposition activities and the possible impact on items in the DMSAs with potential fissile material. The potential adverse unmitigated event of concern was an inadvertent criticality.

The hazard analysis qualitatively determined the likelihood of potential accident scenarios associated with characterization and disposition activities. The SAR provides the consequences of an inadvertent criticality. The consequence estimates in the safety analysis show that there could be significant exposure to personnel on-site; however, exposure offsite is expected to be within evaluation guidelines.

The safety analysis describes the potential for fissile materials in the Phase 2 DMSAs to be in storage configurations that are not in compliance with NCS spacing and storage requirements. It further states that the gaseous diffusion plant process equipment is stored in disorganized arrays without complete characterization and some Phase 2 DMSAs are outside of fixed CAAS coverage.

The SAR provides the analysis of a criticality accident and identifies the implementation of the Nuclear Criticality Programs as the primary control for preventing an accidental criticality.

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**3/4.1.2 PCAAS (LCO 3.1.2)****BASES (Continued)**

In accordance with this program, an NCSE<sup>2</sup> has been prepared and approved that covers the characterization, movement, storage, and disposition of fissile materials within the Phase 2 DMSAs. The NCSE found that the activities constituted a potentially singularly-contingent operation based on the unknowns associated with an uncharacterized area. As required by TSR Section 5.4.1.3, DOE approved, via an SER<sup>4</sup>, the characterization process for DMSAs with demonstrated CAAS coverage while recognizing that there were potentially singularly-contingent activities. Additionally, the SER did not allow the creation of additional potentially singularly-contingent DMSAs or allow continuation of this condition once all characterization process activities were completed.

The SAR identifies the need for active controls to detect and annunciate an accidental criticality event. Specifically, the SAR requires gamma radiation detectors with the capability of detecting a criticality that produces an absorbed dose in free air of 20 RAD of combined neutron and gamma radiation at an unshielded distance of 2 meters from the fissile material.

In the SER<sup>4</sup>, DOE accepted the risk of Phase 2 DMSAs being outside the demonstrated CAAS coverage area for static conditions. Therefore, in order to perform activities that involve movement or disturbance of material (i.e., that impact static conditions) for characterization and disposition in the Phase 2 DMSAs without fixed CAAS coverage, a PCAAS is needed. ANSI/ANS 8.3-1997 is invoked for PCAAS detector placement, annunciation, coverage area, and SURVEILLANCE REQUIREMENTS (SRs).

**LCO**

The detection and alarm capability of a CAAS is necessary for the prompt evacuation of personnel from the affected area to a designated assembly point a safe distance from the incident. PCAAS coverage is required in Outside Phase 2 DMSAs during characterization and disposition activities that may result in the movement or disturbance of stored material.

Providing or proving annunciation of installed PCAAS units in some areas surrounding the Outside Phase 2 DMSAs may not be practical. To provide operational flexibility, demarcation, posting, and restriction of access for these areas meets the annunciation requirements.

**3/4.1.2 PCAAS (LCO 3.1.2)****BASES (Continued)**

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An OPERABLE PCAAS must:

- Have one fixed cluster consisting of a logic module and at least two radiation detectors capable of detecting radiation and having an alarm setpoint not to exceed 16 mR/h. Failure of one of the radiation detection channels will not impair proper detection and alarming of the PCAAS.
- Have alarm signal components and actuation relays capable of providing an alarm that is audible above background noise in each IEZ and/or is visible in portions of the IEZ. The ability of the PCAAS to communicate an alarm condition to workers in accessible portions of the IEZ is critical for the PCAAS safety function to be performed.
- Have the IEZ for applicable DMSAs properly demarcated.
- Have the PCAAS unit properly placed.
- Have communication ability between the Outside Phase 2 DMSA(s) and the central control facility (CCF).

Set-up and placement of the PCAAS and IEZ establishment are controlled as follows:

**Detector Placement**

Methodology for determination of the optimum location of a CAAS detector is described in ANSI/ANS 8.3. This methodology will be utilized to establish appropriate PCAAS detector locations, and will be documented by Bechtel Jacobs Company LLC (BJC) NCS. A qualified NCS Engineer must evaluate and approve the placement of PCAAS.

**Annunciation**

The annunciation portion of the PCAAS is OPERABLE when its signal is audible above background noise and/or visible throughout the IEZ.

Some confined spaces within the IEZ may not be surveyed to determine audibility of the alarm signal because of their very limited use by personnel and the administrative controls governing entrance. However, entry into such areas requires confined space attendants to maintain contact with entrants and to instruct entrants to IMMEDIATELY evacuate in the event of a

**3/4.1.2 PCAAS (LCO 3.1.2)****BASES (Continued)**

PCAAS alarm signal actuation. Confined spaces within the coverage area satisfy the alarm requirement if attendants are present to alert personnel in the confined space of an annunciation of the PCAAS alarm. The confined spaces are evaluated and classified by the Environmental, Safety, and Health Organization, and entry is controlled in accordance with Contractor procedures.

Where temporary work activities or work condition changes could result in significant increases to noise conditions against which annunciation verifications were performed, annunciation will be re-verified to be OPERABLE. Likewise, where temporary work activities or work condition changes could result in significant decreases to visibility conditions against which annunciation verifications were performed, annunciation will be re-verified to be OPERABLE.

**IEZ Establishment**

An IEZ will be established wherein doses of 12 RAD are possible from potential points of nuclear criticality. IEZ boundaries developed for non-leased DOE facilities shall be documented and determined by NUREG/CR-6504, or another DOE-ORO approved methodology.

**IEZ Evacuation**

Immediate evacuation is required for PCAAS annunciation. Immediate evacuation will be assured by establishment of necessary annunciation, and training of personnel for actions to be taken in the event of annunciation or if the system is not OPERABLE. Evacuation plans and rally points will be discussed during pre-job briefings and tailgate briefings.

**IEZ Control After CAAS Annunciation Evacuation**

Evacuation boundaries will be maintained until any necessary monitoring or evaluations associated with annunciation are appropriately assessed.

## 3/4.1.2 PCAAS (LCO 3.1.2)

## BASES (Continued)

MODE APPLICABILITY	The SER <sup>4</sup> for the USQ associated with the Phase 2 DMSAs, accepted the risk of the areas outside of fixed CAAS coverage for static conditions. Therefore, this LCO does not apply to the STANDBY MODE. The STANDBY MODE only allows non-intrusive activities that do not move or disturb Phase 2 DMSA materials. The SER further states that an OPERABLE CAAS is required for those operations involving moving or disturbing items containing fissionable-assay material and that portable units may be utilized. Movement and disturbance of Phase 2 DMSA materials associated with characterization and disposition activities is permitted in the OPERATION MODE.
PROCESS AREA APPLICABILITY	The SER <sup>4</sup> , associated with Phase 2 DMSAs, authorized characterization and disposition activities in Phase 2 DMSAs within leased areas addressed by the requirement for OPERABLE CAAS specified in the leased facility TSR <sup>2</sup> . To address Phase 2 DMSAs outside of fixed CAAS coverage, this LCO establishes the requirements for OPERABLE PCAAS to allow movement and disturbance of DMSA materials associated with characterization and disposition activities in these areas.
ACTION STATEMENTS	<p>Separate Condition entry is allowed for each Outside Phase 2 DMSA. For example, a PCAAS in one DMSA may not be OPERABLE; another may have areas where annunciation is not provided and is not posted. Required ACTIONS are independent unless PCAAS coverage is provided by the same system.</p> <p>Condition A is entered whenever the PCAAS is discovered to be unable to detect a criticality accident for the Outside Phase 2 DMSA. Condition A is also entered whenever annunciation in any portion of the IEZ is lost. As defined in Section 1.1, the system is considered OPERABLE when the required SURVEILLANCE REQUIREMENTS have been accomplished in accordance with the required frequencies and there is no indication that the system is not OPERABLE. Required areas for annunciation are pre-planned prior to work activities and annunciation would be assured prior to the start of planned operations. Access to areas in which the annunciation is not adequate or is not confirmed is restricted prior to declaring the PCAAS OPERABLE.</p>

**3/4.1.2 PCAAS (LCO 3.1.2)****BASES (Continued)**

- A.1 Required ACTION A.1 requires that activities in the Outside Phase 2 DMSA(s) affected by the PCAAS, which is no longer OPERABLE, will be IMMEDIATELY suspended. This ACTION would allow exiting the LCO for the affected Outside Phase 2 DMSA activities since the applicability is only in effect during the OPERATION MODE. IMMEDIATELY is defined in Section 1.1 as an ACTION that is pursued without delay and in a controlled manner and completed within 1 hour. Immediate discontinuance of these operations minimizes the potential for personnel exposure to an accidental criticality by returning the affected Outside Phase 2 DMSAs to a condition in which the criticality risk has been accepted.

Condition B is entered whenever areas in which annunciation is not provided are discovered to be unposted, or not demarcated, or if personnel are discovered in the area. Required areas for annunciation are pre-planned prior to work activities and annunciation would be assured prior to the start of planned operations. Access to areas in which the annunciation is not adequate or is not confirmed is restricted prior to declaring the PCAAS OPERABLE.

- B.1 Required ACTION B.1 requires that activities in the areas affected by the PCAAS, which is no longer OPERABLE, will be IMMEDIATELY suspended. This ACTION would allow exiting the LCO for the affected Outside Phase 2 DMSA activities since the applicability is only in effect during the OPERATION MODE. IMMEDIATELY is defined in Section 1.1 as an ACTION that is pursued without delay and in a controlled manner and completed within 1 hour. Immediate discontinuance of these operations minimizes the potential for personnel exposure to an accidental criticality by returning the affected Outside Phase 2 DMSAs to a condition in which the criticality risk has been accepted.

**3/4.1.2 PCAAS (LCO 3.1.2)****BASES (Continued)****SURVEILLANCE  
REQUIREMENTS**

- 4.1.2-1 This SURVEILLANCE REQUIREMENT requires a FUNCTIONAL TEST of portable CAAS on a DAILY basis (when used). This check consists of assuring the following:
- VERIFY that the PCAAS unit is plugged into an operable 120 VAC source.
  - VERIFY that the UPS AC LINE light (green) is on.
  - VERIFY that the "Ready" light (green) is ON.
  - VERIFY that the "Battery Power" light (yellow) is OFF.
  - VERIFY that the "Alarm" light (red) is OFF.
  - VERIFY that the PCAAS calibration date has not expired.
  - VERIFY that each of three channels of the PCAAS are reading  $\pm 0.5$  mR.
  - VERIFY that no "Rad Alarm" lights are activated on the channel modules.
  - VERIFY that no "Fault" lights are activated on the channel modules.
  - VERIFY that the ambient temperature to which the PCAAS is expected to be subjected during the course of the day is  $> 14^{\circ}\text{F}$ .

These DAILY verifications provide adequate assurance that the PCAAS is operating properly. Failure to successfully meet the requirements of this SR requires entry into Condition A of this LCO.

- 4.1.2-2 This SURVEILLANCE REQUIREMENT requires that communication ability between the work area and the CCF be VERIFIED on a DAILY basis. Communication ability is required in order to communicate PCAAS actuations to the CCF for initiation of emergency response activities. DAILY verifications provide adequate assurance that the communication ability is operating properly. Failure to successfully meet the requirements of this SR requires entry into Condition A of this LCO.

- 4.1.2-3 Sect. 6.3 of ANSI/ANS-8.3 specifies that radiation response testing be performed at least MONTHLY for OPERABILITY verification. In addition to the radiation

**3/4.1.2 PCAAS (LCO 3.1.2)****BASES (Continued)**

response testing, this SURVEILLANCE REQUIREMENT requires that a cluster logic test VERIFY that PCAAS coincidence logic is operating normally. This SURVEILLANCE REQUIREMENT provides assurance that the OPERABILITY requirement of having a logic module and at least two radiation detectors (per fixed cluster unit) capable of detecting radiation is satisfied. Since these portable units usually would be used on a temporary basis, testing is performed upon initial installation for a covered operation, and MONTHLY thereafter as long as the portable CAAS remains in service for that operation. Failure to successfully meet the requirements of this SR requires entry into Condition A of this LCO.

- 4.1.2-4 Sect. 6<sup>4</sup> of ANSI/ANS-8.3 specifies that this testing be performed periodically for OPERABILITY verification. Since these portable units usually would be used on a temporary basis, testing is performed upon initial installation for a covered operation, if noise conditions significantly increase or visibility conditions significantly decrease, and MONTHLY thereafter as long as the portable CAAS remains in service for that operation. The initial annunciation (audible or visual) verification for each PCAAS is based on noise levels or visibility conditions that are expected during work activities.

Some confined spaces within the IEZ may not be surveyed to determine audibility of the alarm signal because of their very limited use by personnel and the administrative controls governing entrance. However, entry into such areas requires confined space attendants to maintain contact with entrants and to instruct entrants to IMMEDIATELY evacuate in the event of a PCAAS alarm signal actuation. Confined spaces within the coverage area satisfy the alarm requirement if attendants are present to alert personnel in the confined space of an annunciation of the PCAAS alarm. The confined spaces are evaluated and classified by the Environmental, Safety, and Health Organization, and entry is controlled in accordance with Contractor procedures.

Where temporary work activities or work condition changes could result in significant increases to noise

**3/4.1.2 PCAAS (LCO 3.1.2)****BASES (Continued)**

conditions against which annunciation verifications were performed, this SURVEILLANCE REQUIREMENT must be performed. Likewise, where temporary work activities or work condition changes could result in significant decreases to visibility conditions against which annunciation verifications were performed, this SURVEILLANCE REQUIREMENT must be performed.

Failure to successfully meet the requirements of this SR requires entry into Condition A of this LCO.

- 4.1.2-5 ANNUAL calibration of each detector module is conducted to ensure that each module is operating properly and will activate the system at the established set points. Certified gamma sources and measuring instruments traceable to appropriate national standards are utilized. Each detector is calibrated on an ANNUAL basis. The high radiation alarm is set for  $15\text{mR/h} \pm 1$  ( $10\text{mR/h} \pm 0.5 + 5\text{mR/h} \pm 0.5$  self-check signal). The  $15\text{mR/h}$  setpoint and the  $\pm 1.0\text{mR/h}$  tolerance are high enough to minimize the probability of an alarm from sources other than criticality and low enough to detect a criticality accident in the required detection coverage area. This setting is based on ANSI/ANS-8.3, Section 4.4.4.

Failure to successfully meet the requirements of this SR requires entry into Condition A of this LCO.

- 4.1.2-6 In some cases, annunciation may not be reasonably achievable in portions of the IEZ with PCAAS installation. In these instances, the area is demarcated, posted, and personnel access restricted. Since the portable units would typically be used on a temporary basis, verification of proper demarcation and posting for these areas, and verification that the areas are unoccupied is performed upon initial installation for a covered operation and MONTHLY thereafter. Failure to successfully meet the requirements of this SR requires entry into Condition B of this LCO.



**3/4.1.2 PCAAS (LCO 3.1.2)****BASES (Continued)****REFERENCES**

1. ANSI/ANS-8.3-1997, May 1997, *Criticality Accident Alarm System*
2. NCSE-RM-0005, Rev. 1, January 2002, *Characterization, Movement, Storage, and Disposition of DMSA and DRA NCS-Restricted Area Materials*
3. KY/EM-174, Rev. 0-A, March 1997, *Safety Analysis Report Paducah Gaseous Diffusion Plant Paducah, Kentucky*
4. Letter from W. Don Seaborg to Gordon L. Dover, dated March 28, 2000, *Request for Approval of Modified Safety Evaluation Report for Unreviewed Safety Question Associated with Department of Energy Material Storage Areas – EM&EF-078.*
5. Letter from Jimmy Massey to Jimmie Hodges, dated September 13, 1999, *Request for Approval – Unreviewed Safety Question Associated with Department of Energy Material Storage Areas (DMSAs).*
6. Letter from Paul F. Clay to Gerald G. Boyd, September 11, 2002, *Request for Approval of Justification for Continued Operation (JCO) for Phase 2 U.S. Department of Energy (DOE) Material Storage Areas (DMSAs) That Are Outside of Fixed Criticality Accident Alarm System (CAAS) Coverage.*
7. NUREG/CR-6504, *An Updated Nuclear Criticality Slide Rule*, Oak Ridge National Laboratory, published April 1997.

**3/4.2 C-745-T CYLINDER STORAGE YARD BOUNDARY****BASES**

**BACKGROUND** Portions of the C-745-T Cylinder Storage Yard are within 900 FEET of the site boundary. The cylinder yard fire event cited in the SAR is predicted to exceed offsite EGs at 900 feet from the source of the release. A boundary was established at a minimum of 900 feet from the site boundary across C-745-T to ensure that the analyses remain valid. The barrier, a combination of cylinder chocks, barrier fencing, stanchions, and signs provides defense-in-depth that a significant challenge to the facility safety basis will not occur.

**APPLICABLE SAFETY ANALYSIS** Section 3.4.2.2.1.2 of the SAR cites several institutionalized controls and programs which minimize the potential for a cylinder yard fire. However, the fire still is assumed to be a credible event. An accident within C-745-T could exceed offsite EGs in that portion outside the established boundary.

**LCO** The presence of a defined boundary will ensure that cylinders containing UF<sub>6</sub> are not moved to a position which, in the event of a fire, could result in offsite impact. The buffer zone is established to allow safe access and egress when moving cylinders within the yard.

**APPLICABILITY** Demarcation of the boundary is required anytime CYLINDERS CONTAINING UF<sub>6</sub> are present in C-745-T.

**ACTIONS** The analyses present in the SAR identify the movement of cylinders by handling equipment as the primary initiator of a large fire. Restoration of the barrier to its original condition will ensure cylinders are placed in the approved portion of the yard.

**SURVEILLANCE REQUIREMENTS** 4.2.1-1

A monthly inspection should detect aging conditions in the fencing and anchoring mechanisms to the stanchions.

4.2.1-2

A semiannual inspection should detect aging conditions in the postings which impact legibility.